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Weapon Injury Update

News from the Weapon-Related Injury Surveillance System (WRISS) April 1997

Weapon Injuries Declining in Massachusetts

Biggest declines noted among black residents and high-risk cities

Cases of violence-related gunshot wounds dropped 41% from 1994 to 1996 according to reports filed by hospital emergency departments with the Massachusetts Department of Public Health, dropping from 662 cases treated in 1994 to 393 in 1996. Sharp instrument assaults also declined 18%, from 1,885 to 1,553 cases. Accidental gunshot wounds did not drop (see Table 1).

The biggest declines in emergency department assault cases were noted among black, non-Hispanic residents, as shown in Figure 1. Shootings were down 50% for blacks and for Hispanics, compared with 25% for whites. Stabbings declined 26% for black residents, 13% for Hispanic residents, and 10% for white residents.

Among teenaged males, gun assaults decreased most among black youths (56%), a notable development because this group has been at highest risk for gun assaults. Although stabbings were down overall among black residents, among black teen males (ages 15-19) stabbings were up 30%. Stabbings were down 27% and 14% respectively for Hispanic and white teen males from 1994 to 1996.

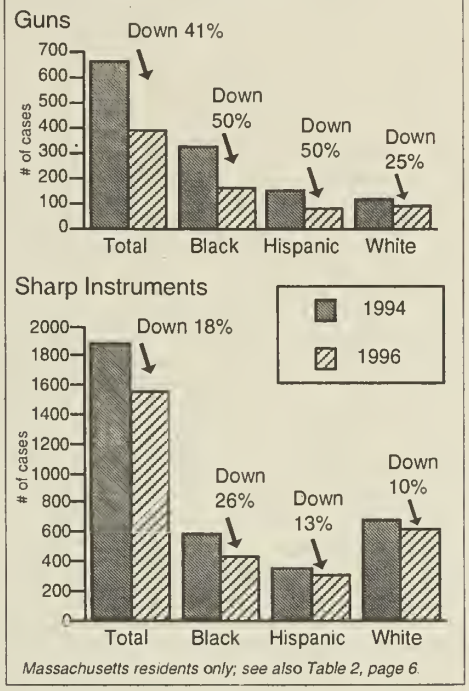
Declines Seen in Many Cities

The drop in weapon injuries was consistent with police-reported declines in violent crime and murder and appeared to be part of a longer-term downward trend. Although statewide hospital reporting has only been in place since 1994, hospitals in selected larger cities have been reporting since 1992. Boston has received deserved media attention for its decline in violent injuries; however, similar declines have also occurred in Springfield, Brockton, and New Bedford since 1992. (See Figure 3, page 6.) Weapon assaults treated among New Bedford residents dropped nearly 50% from 1992-1996.

From 1995 to 1996 alone violence-related weapon injuries declined 25% statewide. The drop occurred almost exclusively in the ten communities with the highest weapon injury rates in 1995. (See page 5.) Cases in cities with low or moderate weapon injury rates, and in small communities, did not decline on average. Only one of the top-ten 1995 communities, Lawrence, showed a slight increase in 1996; the remainder (Chelsea, Brockton, Springfield, Boston,

Continued on back page.

Fig.1–Violence-Related Cases Treated in Emergency Depts, Mass. 1994-96



Massachusetts residents only; see also Table 2, page 6.

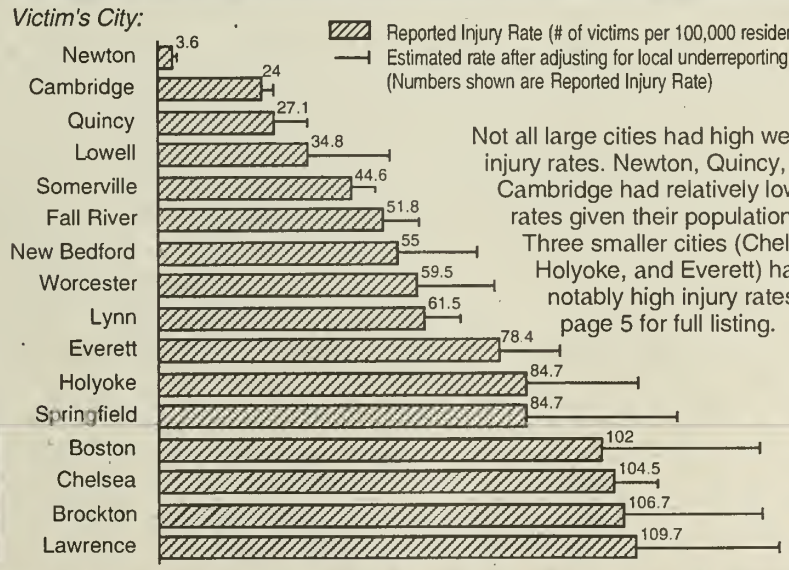
Table 1–Victims of Gunshot Wounds and Sharp Instrument Wounds Treated in Mass. Emergency Departments

	1994 cases	1995 cases	1996 cases	1996 rate
Massachusetts Cases	2865	2512	2219	36.9
• Violence-Related Injuries	2547	2210	1946	32.3
Guns (GSW)	662	526	393	6.5
Sharp Instruments	1885	1684	1553	25.8
• Accidental GSW*	163	155	166	2.8
• Self-inflicted GSW	47	47	35	.6
• Unknown GSW	108	100	72	1.2
Total Mass. GSW Cases	980	828	666	11.1
Firearms	822	687	495	8.2
Nonpowder Guns*	158	141	171	2.8
Out-of-State Cases	63	53	53	--
Total Victims	2928	2565	2272	--

NOTES: Rates are per 100,000 population based on the 1990 US Census Modified Age Race Sex File for Massachusetts. Hospitals report slightly over 75% of reportable cases. Fatalities not transported to emergency departments (EDs) are not reported here. See back page for 1995 mortality data. Most self-inflicted GSWs result in death and are not taken to the ED (see page 2).

* Among 171 nonpowder gun injuries (BB/pellet/air gun) in 1996, 108 were reported as accidental, 43 violence-related, 3 self-inflicted, and 17 unknown.

Fig. 2–Violence-Related Gunshot and Sharp Instrument Wounds Treated in Emergency Depts., Selected Cities, 1996



Not all large cities had high weapon injury rates. Newton, Quincy, and Cambridge had relatively low rates given their population size. Three smaller cities (Chelsea, Holyoke, and Everett) had notably high injury rates. See page 5 for full listing.

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Self-Inflicted Firearm Injuries

84% of self-inflicted gunshot wounds were fatal in 1994

All acute care hospitals in Massachusetts report gunshot wound victims treated in the emergency department (ED). About two-thirds of gun suicides are not treated in the emergency department because death occurs almost instantly. To get a more complete picture of these and other weapon injuries, the Weapon-Related Injury Surveillance System (WRISS) linked emergency department reports with inpatient hospital records and death certificates for state residents who died or were treated for weapon injuries in Massachusetts in 1994.

The resulting dataset covered people who turned the gun against themselves as well as victims of gun accidents, gun assaults, and sharp instrument assaults (stabbings and slashings). Of all weapon injury types, the most lethal were self-inflicted firearm injuries. Eighty-four percent were fatal in 1994. Among firearm assault victims, 16.2% died, or an estimated 5.2 victims survived for every victim who died. Gun accident victims fared much better, as indicated in Figure 1. Of a total estimated 91 firearm accidents (excluding BB and air gun injuries) four (4.2%) died. In calculating case fatality rates, we took hospital underreporting into account by adjusting nonfatal injury cases upward. (Nonfatal cases were divided by .75, the statewide reporting rate.)

Among firearm fatalities, suicides slightly outnumbered homicides in 1994; however among ED-treated firearm injuries, only 3% were self-inflicted. Most (77%) were violence-related; 10% were accidental and 10% were unknown. (See Figure 2.)

Virtually all of the self-inflicted wounds treated in the emergency department were admitted for inpatient care. The demographic characteristics of those who survived differed from those who died. (See Table 1.) A higher proportion of survivors lived in urban areas (63% of survivors vs. 34% of suicide victims), and a lower proportion were white (44% vs. 96%). The mean age of those with nonfatal wounds was younger: 33.3 years compared with 47.4 for fatal wounds.

It would be imprecise to refer to self-inflicted gunshot wounds generically as "suicide attempts." Medical providers' notes on a few of the reporting forms indicated that the shooting was an act of self-mutilation (for example, a patient who shot a finger because he was angry with himself).

Firearm injuries made up 31% of all suicides in Massachusetts in 1990-94, compared with about 60% nationally. While the state's total suicide rate and gun suicide rate are significantly lower than the national rate, the rate of non-gun suicides is higher. Firearm suicides have remained about steady in Massachusetts over the past 15 years, showing no significant growth in any age group. Motor vehicle deaths have declined in recent years, and 1994 marked the first year that suicide by any means (gun and non-gun) outnumbered motor vehicle deaths.

Although BB and pellet guns were excluded from the data linkage, a suicide committed with a pellet gun was recorded on a death certificate in 1994.

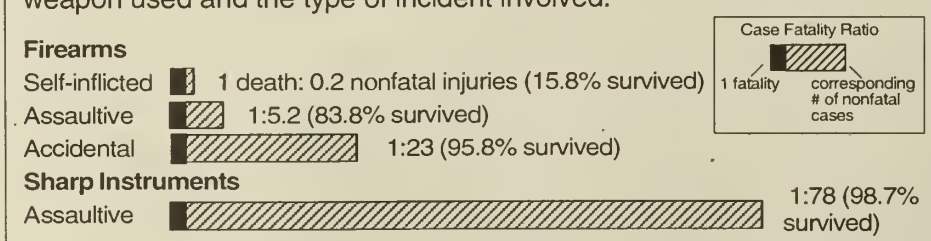
Table 1–
Victims of Self-Inflicted Firearm Injuries, Mass. 1994

	Nonfatal		Fatal	
TOTAL	27	100.0%	144	100.0%
0-14 yrs	0	0.0%	2	1.4%
15-19 yrs	4	14.8%	5	3.5%
20-24 yrs	7	25.9%	13	9.0%
25-44 yrs	11	40.7%	54	37.5%
45-64 yrs	2	7.4%	35	24.3%
65 yrs +	3	11.1%	35	24.3%
Mean Age	33.3 yrs		47.4 yrs	
Male	23	85.2%	132	91.6%
Female	4	14.8%	12	8.3%
Black	7	25.9%	4	2.8%
White	12	44.4%	138	95.8%
Hispanic	3	11.1%	1	.7%
Other/Msng	5	18.5%	1	.7%
Urban Centers	17	63.0%	49	34.0%
Suburbs	7	25.9%	65	45.1%
Rural and Other	2	7.4%	30	20.8%

Source: 1994 WRISS Emergency Department Reports, Uniform Hospital Discharge Data Set, and Death Certificates, Mass. residents only; MDPH

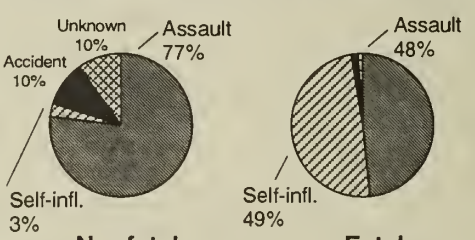
Fig. 1–
Surviving a Weapon Injury

Odds of surviving a weapon injury depended both on the type of weapon used and the type of incident involved.



Source: 1994 Death Certificates and WRISS Emergency Department Reports, MDPH. Data include only Massachusetts residents who died or were treated in Massachusetts in 1994. Nonfatal injury cases were inflated to adjust for hospital underreporting.

Fig. 2–
1994 Firearm Injuries to Massachusetts Residents



	Nonfatal		Fatal	
TOTAL	947	100%	292	100%
Assaults	732	77%	141	48%
Self-Infl.	27	3%	144	49%
Accidents	91	10%	4	1%
Unknown	97	10%	3	1%

Source: Death Certificates and WRISS Emergency Department Reports, MDPH. Nonfatal injury cases were inflated to adjust for hospital underreporting.

Survey Finds Fewer Guns in Massachusetts Homes

US rate nearly three times higher than Massachusetts rate for adults reporting a gun at home

In 1995, 15% of adults in Massachusetts reported having a gun in their home or vehicle, according to the Behavioral Risk Factor Surveillance System. The BRFSS is a telephone survey conducted by the Department of Public Health on the health practices of Massachusetts residents. In 1995, WRISS added a module on gun ownership to the survey.

The proportion of adults with a gun at home was much lower in Massachusetts than nationally. Forty-one percent of adults in the US reported having a gun of any type at home, and 24% reported having a handgun, according to a 1994 National Opinion Research Center survey. In Massachusetts, only 7.5% of adults reported having a handgun.

Most guns were acquired for reasons other than self-protection (sporting or recreational purposes, for example), according to the Massachusetts survey; self-protection was the primary reason cited by 24% of owners. Among households with guns, 9% stored the guns loaded and unlocked some of the time. Thirty-one percent of gun-owning households had children living in the home.

Are the Results Reliable?

Most people answered the gun module (69 out of 3,311 declined). But were the answers accurate? A previous study found that when a sample of people who had recently registered a handgun or purchased a hunting license were asked in a telephone survey if they had a gun at home, close to 90% of both groups said yes. We therefore would expect the rate of adults with licensed guns at home to be reasonably well reflected by the survey. However, unlicensed guns may not be. People who own guns illegally are probably less likely to be included in the survey, and, if included, less likely to discuss the presence of a gun.

Guns at Home and Injury Rates

Massachusetts had the lowest reported gun-at-home rate among 11 states that have reported BRFSS firearm results. Massachusetts also had the second lowest firearm death rate in the nation, according to a 1991 study by the National Center for Health Statistics. Is there a connection between low ownership and low mortality rates? The question is intriguing but probably cannot be answered simply by comparing gun-at-home rates and gun injury rates across populations. A variety of other factors (local crime rates, socioeconomic status, individual-level factors such as personality, etc.) may be more important in predicting injury rates. However, we were curious to look at how regional gun-at-home rates compared to gun injury rates.

BRFSS data were disaggregated to five regional levels in the state: Western, Central, Northeast, Boston-area, and Southeast. The graph opposite plots gun-at-home rates and five-year average annual suicide rates in the five regions. Gun suicide rates were higher in regions reporting higher gun ownership and lower in regions reporting lower gun ownership. Non-gun suicides were higher in areas reporting lower gun-at-home rates (although the overall suicide rate was lower in these areas).

While gun suicides are more likely to be committed with licensed weapons, most gun assaults involve unlicensed guns. One therefore would not necessarily expect to find a positive relationship between reported gun-at-home rates and gun assault rates, and indeed there was no relationship (positive or negative) observed at the regional level. At the city level, five urban areas oversampled in the survey had lower reported gun ownership rates than the rest of the state and higher gun assault rates. This is consistent with findings from other states using BRFSS gun modules. Only 3.6% of Boston-area respondents reported having a gun, far lower than in other cities. To what extent this was affected by underreporting of unlicensed guns is unknown.

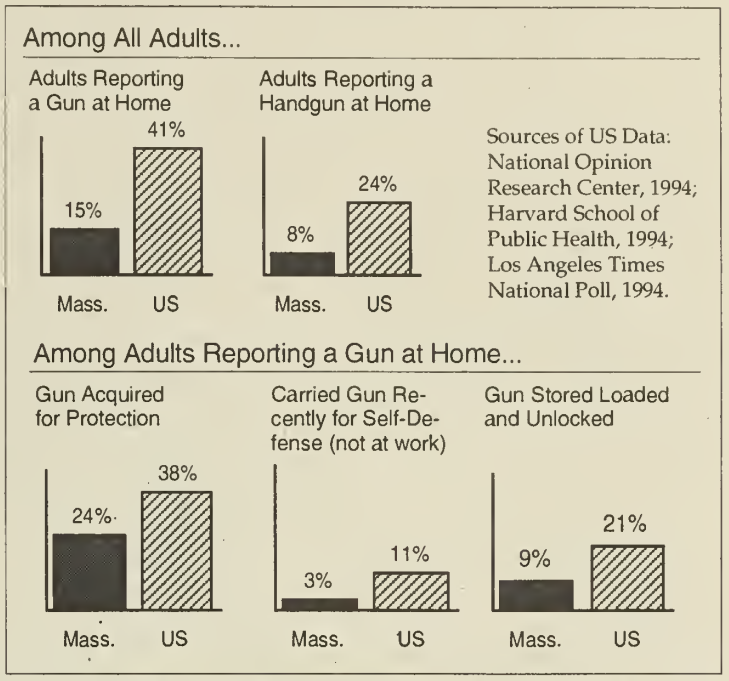


Fig. 1–1995 Mass. Behavioral Risk Factor Survey results.

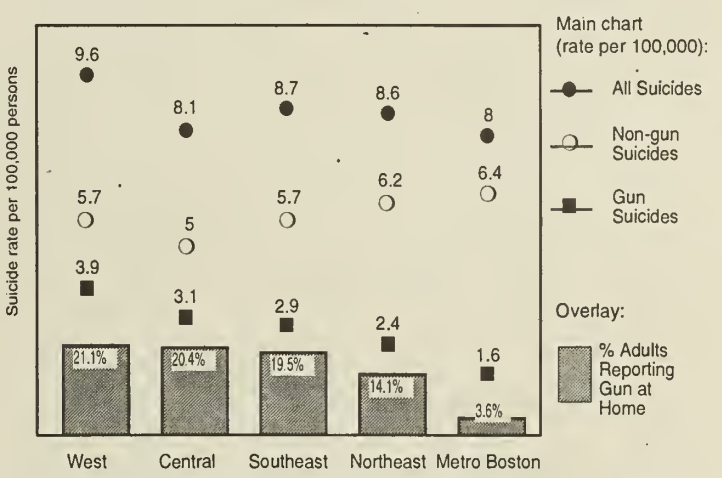


Fig. 2–1990-94 average annual suicides per 100,000 overlaid by % adults reporting gun at home, by Massachusetts region.
Source: 1995 Mass. BRFSS and 1990-1994 Death Certificates, MDPH

Database Maps Weapon Injuries in Massachusetts Communities

The risk of being stabbed or shot in a violent attack is not borne equally by all residents of the state. Where you live and who you are makes a dramatic difference. WRISS researchers assembled a Community Database to learn the characteristics of the communities in which injuries occur. The database includes victim and incident data on weapon injuries, population counts by five-year age/race/sex groups, police data, socioeconomic status indicators for communities, and other information. The database enables WRISS to analyze factors that are correlated with local weapon injury rates and to calculate specific local injury risks.

For example, after combining emergency department and death certificate data, we learned that black male teenagers in Boston (ages 15-19) had a 1-in-38 risk of being shot or stabbed in 1994 compared to 1-in-56,000 for white females of any age in suburban communities. (See Table 1.)

The Community Database also helps us identify high risk groups at the local level. Among males in Boston, there was a striking difference in the rate of gun assault victimizations when broken down by age group and by ethnicity. (The breakdown for stabbings was not as polarized by ethnicity and age). Black male teenagers (15-19) and young adults (20-24) were at significantly higher risk of gun assault than older black males. They were over 40 times more likely to be shot than white male teenagers. Among Boston's male teenagers, six white, 22 Hispanic, and 130 black youths were injured or killed in gun assaults over a two-year period (1994 and 1995) according to emergency department reports and death certificates.

Table 1–Risk of Being Shot or Stabbed in 1994 (Sample of findings)

Males 15-19 yrs, Boston	
Black, nonHispanic	1 in 38
White, nonHispanic	1 in 422
Children 0-14 yrs, Mass.	1 in 14,020
Elders 65+, Urban Centers	1 in 23,294
White females, Suburbs	1 in 56,083

SOURCE: Death Certificates and WRISS Emergency Department Reports, MDPH

Among the two other cities with high gun assault rates–Brockton and Springfield–the high risk groups were somewhat different than in Boston. Because the population of the two cities was smaller, data from the two were combined. Unlike Boston, in Brockton and Springfield the group with the highest incidence rate for violence-related gunshot wounds was Hispanic male teenagers. The fact that the highest-risk group varied from one city to the next seems to indicate that a dynamic combination of socioeconomic factors and neighborhood-specific conditions give rise to high incidence rates.

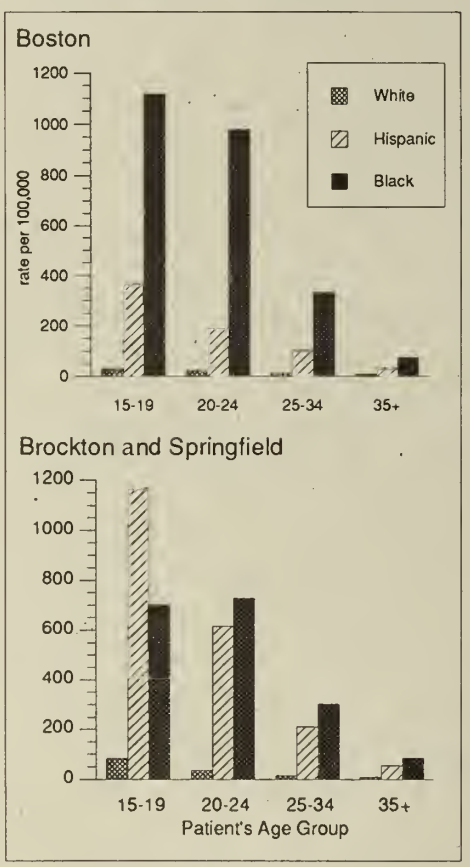
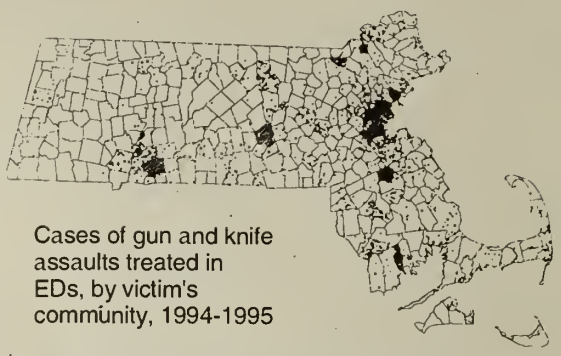


Fig. 1–Violence-related firearm injuries to males per 100,000 residents, 1994-1995

NOTES: Rates are average annual rates per 100,000 residents based on the 1990 US Census. The actual population in 1994/95 is likely to have changed; however updated population estimates by city and by race/age/sex were not available at press time. SOURCE: Death Certificates and WRISS Emergency Dept. Reports, MDPH



Cases of gun and knife assaults treated in EDs, by victim's community, 1994-1995

The variation in rates also demonstrates the importance of using local data when planning violence prevention efforts. Injury prevention groups are welcome to contact the WRISS project for local data by calling (617) 624-5600.

Looking for More Information?

WRISS publications available:

- "When Bullets Don't Kill: A New Surveillance System Targets Firearm Injuries" *Public Health Reports*, Nov./Dec. 1996 - Feature article
- Homicide in Massachusetts: Characteristics and Trends: 1978-1993 (1994 & 1995 Addendum included) - 44 page booklet
- Under the Gun: Using the BRFSS to Track Gun Ownership and Safety (WRISS bulletin)
- Do Domestic Shootings and Stabbings Cluster in Certain Communities? Evidence from a Statewide Emergency Department Database (WRISS bulletin)
- Weapon Injury Data Summaries (variety of statewide datasheets available plus separate datasheets for 15 highest risk Massachusetts cities)

Call (617) 624-5600

Violence-Related Gunshot Wounds and Sharp Instrument Wounds

1995 and 1996 Cases Reported by Mass. Hospital Emergency Departments to Mass. Dept. of Public Health

Victim's City/Town	'90 Population	1995 Cases	1996 Cases	'96 Rate/ 100,000 pop.	Victim's City/Town	'90 Population	1995 Cases	1996 Cases	'96 Rate/ 100,000 pop.
Group 1: Cities/towns over 175,000 population									
Boston	574,283	704	586	102.0	*Group 1 Total*	*574,283*	*704*	*586*	*102.0*
Group 2: Cities/towns 75,000-175,000 population									
Brockton	92,788	126	99	106.7	Newton	82,585	3	3	3.6
Cambridge	95,802	24	23	24.0	Quincy	84,985	18	23	27.1
Fall River	92,703	33	48	51.8	Somerville	76,210	29	34	44.6
Lowell	103,439	37	36	34.8	Springfield	156,983	207	133	84.7
Lynn	81,245	74	50	61.5	Worcester	169,759	114	101	59.5
New Bedford	99,922	68	55	55.0					
					Group 2 Total	*1,136,421*	*733*	*605*	*53.2*
Group 3: Cities/towns 50,000-75,000									
Brookline	54,718	5	3	5.5	Malden	53,884	24	24	44.5
Chicopee	56,632	22	9	15.9	Medford	57,407	11	13	22.6
Framingham	64,989	16	10	15.4	Waltham	57,878	10	8	13.8
Haverhill	51,418	16	28	54.5	Weymouth	54,063	8	11	20.3
Lawrence	70,207	67	77	109.7					
					Group 3 Total	*521,196*	*179*	*183*	35.1
Group 4: Cities/towns 25,000-50,000									
Agawam	27,323	2	0	0.0	Milford	25,355	7	2	7.9
Amherst	35,228	1	2	5.7	Milton	25,725	8	2	7.8
Andover	29,151	2	0	0.0	Natick	30,510	0	1	3.3
Arlington	44,630	1	0	0.0	Needham	27,557	0	0	0.0
Attleboro	38,383	6	7	18.2	North Attleboro	25,038	1	5	20.0
Barnstable	40,949	7	8	19.5	Northampton	29,289	2	1	3.4
Beverly	38,195	5	6	15.7	Norwood	28,700	3	2	7.0
Billerica	37,609	2	4	10.6	Peabody	47,039	5	4	8.5
Braintree	33,836	3	7	20.7	Pittsfield	48,622	9	18	37.0
Chelmsford	32,383	1	5	15.4	Plymouth	45,608	10	5	11.0
Chelsea	28,710	50	30	104.5	Randolph	30,093	8	5	16.6
Dartmouth	27,244	2	5	18.4	Revere	42,786	32	20	46.7
Dracut	25,594	0	0	0.0	Salem	38,091	9	7	18.4
Everett	35,701	14	28	78.4	Saugus	25,549	3	7	27.4
Falmouth	27,960	0	0	0.0	Stoughton	26,777	2	1	3.7
Fitchburg	41,194	20	15	36.4	Taunton	49,832	16	20	40.1
Gloucester	28,716	5	2	7.0	Tewksbury	27,266	1	0	0.0
Holyoke	43,704	50	37	84.7	Watertown	33,284	5	3	9.0
Leominster	38,145	6	7	8.4	Wellesley	26,615	1	1	3.8
Lexington	28,974	1	2	6.9	West Springfield	27,537	7	2	7.3
Marlborough	31,813	4	4	12.6	Westfield	38,372	14	5	13.0
Melrose	28,150	2	3	10.7	Woburn	35,943	9	8	22.3
Methuen	39,990	9	14	35.0					
					Group 4 Total	*1,519,170*	*345*	*305*	*17.6*
Group 5: under 25,000 population					*Group 5 Total*	*2,265,355*	*172*	*184*	*8.1*
Massachusetts					*Massachusetts*	*6,016,425*	*2,210*	*1,946*	*32.3*

NOTES: Cases are reported by hospitals and are not adjusted for underreporting. Based on record reviews, hospitals report approximately 75% of reportable cases. Pre-hospital deaths are not included in the reporting system. Rates are based on the 1990 US Census Modified Age Race Sex File; 1995 population estimates may produce more accurate rates in municipalities experiencing significant population changes. Towns under 25,000 population are not separately listed because low case incidence and small population result in unstable rates. The Massachusetts total includes homeless cases and cases with unknown city (4 homeless and 79 unknown in 1996).
SOURCE: Weapon-Related Injury Surveillance System (WRISS), Massachusetts Department of Public Health.

Weapon Injuries Declining

(Continued from page 1)

Holyoke, Lynn, Revere, New Bedford, and Worcester) showed significant declines. Among cities with more moderate weapon injury rates, caseloads generally remained steady, notable exceptions being increases among residents of Everett (the only newcomer to the top-ten list in 1996), Haverhill (which moved to eleventh place), and Fall River.

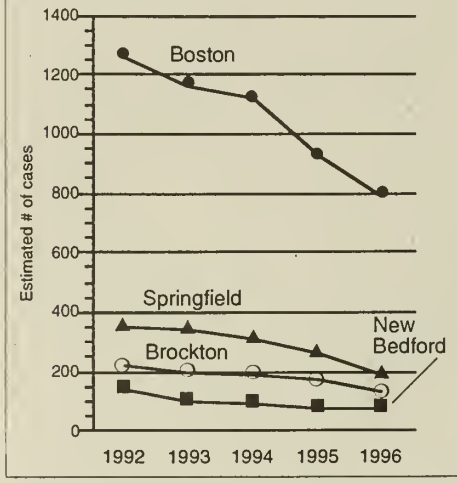
Boston has recently gained considerable attention for its drop in shooting deaths among juveniles ages 0-16. Emergency department data on firearm assaults also showed significant declines both in Boston and statewide. Throughout the state (exluding Boston), cases of juvenile firearm assaults dropped from 34 in 1995 to 16 in 1996; in Boston the figures dropped from 17 to 8. Throughout the rest of the state stabbings also declined among juveniles (from 93 to 78); however in Boston stabbings among juveniles increased from 30 to 38.

Massachusetts is the first state in the nation to track weapon injury victims treated in emergency departments. Hospital personnel report cases to the Massachusetts Department of Public Health's Weapon-Related Injury Surveillance System (WRISS). WRISS staff audited patient records covering one to two month's ED visits at the 15 high caseload hospitals and at a one-third random sample of the remaining sites each year from 1994-1996. Hospitals reported slightly over 75% of their cases each year. The drop in cases, therefore, was not due to a change in reporting level. Reported cases were demographically similar to unreported cases identified in record reviews; cases with a diagnosis of gunshot wound or stab wound were better reported than those with a diagnosis of laceration.

Fig. 3–

Weapon Injury TRENDS

Visits to emergency departments for violence-related weapon injuries declined in major cities from 1992 -1996.*



* Numbers graphed are estimates. Actual reports were inflated to adjust for city-specific underreporting rates each year.

Table 3–Deaths of Mass. Residents, Selected Causes, 1995

	n	%
Homicides	*225*	*100%*
Firearm	122	54%
Sharp Instrument	51	23%
Other	52	23%
Suicides	*496*	*100%*
Firearm	148	30%
Other	348	70%
Firearm - Accident	3	
Firearm - Undetermined	1	
All Firearm Deaths	274	

Notes: Homicides include 1 death due to legal intervention; 15 firearm deaths occurred out of state. *SOURCE: Death Certificates, Registry of Vital Records & Statistics, MDPH*

Table 2–ED Patients with Violence-Related Injuries, 1994-1996

	Gunshot Wounds			*Sharp Instrument Wounds*		
	1994	*1996*	*% change*	*1994*	*1996*	*% change*
All Victims	662	393	-41%	1,885	1553	-18%
Male	598	342	-43%	1,566	1283	-18%
Female	49	33	-33%	291	238	-18%
Black, nonHispanic	328	165	-50%	586	436	-26%
Hispanic	157	78	-50%	355	309	-13%
White, nonHispanic	121	91	-25%	687	617	-10%
0-14 yrs	20	17	-15%	39	34	-13%
15-19 yrs	197	110	-44%	337	307	-9%
20-24 yrs	197	103	-48%	414	338	-18%
25-34 yrs	150	86	-43%	663	499	-25%
35-64 yrs	72	53	-26%	407	337	-17%
65+ yrs	1	1	0%	10	9	--

SOURCE: WRISS Emergency Department reports for Massachusetts residents, MDPH

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